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SOME ODONATA OF RAPA ISLAND, WITH DESCRIPTIONS OF THREE POLYNESIAN SPECIES OF ISCHNURA CHARPENTIER

BY

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Abstract

The writer reports on a collection of Odonata from the South Sea island of Rapa. Among the 4 species recorded, one, *Ischnura thelmae* spec. nov., is described from both sexes as new. Two other members of the same genus, previously only known from the types, are *I. spinicauda* Brauer, 1865 (Polynesia) and *I. taitensis* Selys, 1876 (Tahiti). These are re-characterized and figured, the last-mentioned species after fresh topotypical material from the Society Islands. *I. cheesmani* Fraser, 1942, also from Tahiti, is considered synonymous with *I. taitensis* Selys.

The present paper deals with a small collection of Odonata made in the island of Rapa, in the South Pacific, by Dr. J. F. GATES CLARKE and his wife, Mrs. THELMA M. CLARKE. The main object of this visit was to investigate the micro-lepidoptera of that remote island, but fortunately other insects were also collected. This trip was undertaken in 1963 in behalf of the United States National Museum, Washington D.C., and made possible by a grant supplied by the Office of Naval Research. I am much indebted to the authorities of the above museum, particularly Messrs. J. F. GATES CLARKE and OLIVER S. FLINT, Jr., for the privilege of examining this material, which includes a species of *Ischnura* apparently new to science. The receipt of this collection offered a welcome opportunity to re-characterize at the same time two other species of *Ischnura* also reported from the South Pacific. These species, of uncertain status since the time of their description, are *I. spinicauda* Brauer, 1865, and *I. taitensis* Selys, 1876, both of them hitherto known only from the types. A re-examination of the former was made possible by the courtesy of Dr. MAX BEIER, of the Naturhistorisches Museum, Vienna; Dr. G. DEMOULIN has been kind enough to lend me the types of *I. taitensis* from DE SELYS's collection in the Institut royal des Sciences Naturelles at Brussels. I wish to express my best thanks also to Dr. J. L. GRESSITT, of the Bernice P. Bishop Museum, Honolulu, for his continuous help and generosity in letting me study the extensive collections of Odonata accumulated by him and his co-workers in various parts of the Indo-Australian and Pacific areas.

The following information is based on the results of the "St. George" Expedition to the South Pacific whose members, Mr. C. L. COLLENETTE and Miss C. E. LONGFIELD, were probably the first to make entomological collections on Rapa during

their stay on the island, from April 10 to 18, 1925. Miss LONGFIELD very kindly furnished me with several interesting publications giving full details of Rapa and other southern Pacific islands. I have selected a few of the most important amongst these for inclusion in the list of references, COLLENETTE's fascinating book, so well illustrated by Miss LONGFIELD, being certainly most helpful in visualising the conditions met with by these explorers.

RAPA ISLAND

The next particulars of the oceanic island of Rapa (also known as Oparu) are extracted in part from an article on its flora by L. A. M. RILEY in the *Bulletin of Miscellaneous Information*, no. 2 (1926), issued by the Royal Botanic Gardens, Kew.

Rapa is situated in $27^{\circ} 36' S.$, $144^{\circ} 17' W.$, and is five miles in length by four in breadth. It is of volcanic origin with steep jagged peaks, the highest of which rises to 2077 feet. In shape it resembles a misshapen letter C, thickened towards the north and south, with the interior occupied by Ahurei Bay, which fills the bed of an ancient crater and opens to the sea on the eastern side. Excellent maps and photographs of its topography are contained in COLLENETTE (1925) and CHUBB & SMITH (1927). The island is little visited by vessels and, according to the first author, the natives still use the candle-nut (*Aleurites moluccana*) for illumination in preference to oil. As COLLENETTE writes, the neighbourhood of the village of Ahurei presents little of botanical interest, but the island possesses many streams, which are utilised on the lower ground for the irrigation of extensive taro beds (*Colocasia*), the principal food of the inhabitants. The greater part of the hill slopes are covered with a growth of short grass and a species of fern, larger growth being kept down by grass fires and by the high winds which bend and deform any isolated unsheltered trees. Thick vegetation clothes some of the higher peaks, the sheltered and damp gullies down to sea level, and the slopes of detritus at the foot of cliffs. At about 500 feet a tree-fern makes an appearance, becoming more plentiful as the elevation increases and eventually completely dominating all other trees.

To appreciate the remoteness of this little island reference should be made to a map. Associated with Rapa at some distance are the much smaller Marotiri and the Neilson rock and reef; otherwise the next neighbours are the Austral group (Tubuai Is.), the nearest 250 miles distant, but these are also mere scattered specks, and the Cook group at 800 miles no better. It may be added that the Society Islands (with Tahiti and Borabora) and the Tuamotus are situated about 750 miles toward the north, Pitcairn almost 900 miles due east-northeast, Samoa being about 1600 miles, Fiji almost 2000, and the Kermadec group approximately 2100 miles away.

As far as I am aware no dragonflies have yet been recorded from Rapa. With the exception of the new *Ischnura*, which in all probability is endemic in the island, all specimens contained in the present collection belong to species having a very wide distribution.

LIST OF SPECIES

Coenagrionidae

***Ischnura a. aurora* Brauer, 1865 (Fig. 3)**

Material. — 18 ♂, 15 ♀, Rapa, Haurei, 6-16 and 28.IX.1963.

All females belong to the heterochromatic, dark colour form.

This little dragonfly is a wind-borne species, breeding in stagnant waters of every kind. Originally described from Tahiti it is distributed far beyond its many oceanic settlements, ranging from northwest India and Ceylon through southeast Asia, Australia and New Zealand. Chiefly coastal throughout the South Sea islands and elsewhere, *I. aurora* also has a number of isolated montane habitations in parts of Java and New Guinea, where it seems to have firmly established itself. Remarkably enough, a distinctive subspecies, lacking blue markings on the terminal segments of abdomen, has developed in the mountain valley of the Baliem River (Central North New Guinea) and occurs nowhere else on that continent. A second red-bodied *Ischnura*, nearly related with *I. aurora* but specifically distinct therefrom, was discovered in the Arfak Mountains of the Vogelkop, in West New Guinea. For further particulars, including references, notes on the distribution, and an account of the larvae of some species, see LIEFTINCK (1949, 1959 and 1962).

***Ischnura thelmae* spec. nov. (Fig. 1)**

Material. — A small series comprising both sexes, described hereafter.

Libellulidae

***Diplacodes bipunctata* (Brauer)**

Material. — 31 ♂, 26 ♀, Rapa, Haurei, 8-28.IX and 1-28.X.1963.

This is also a common and wide-ranging dragonfly, from the Moluccas eastward far into the Pacific; it has been reported from almost all Polynesian island groups, but goes high up into mountainous areas all over its range.

***Pantala flavescens* (F.)**

Material. — 23 ♂, 23 ♀, Rapa, Haurei, 11-28.IX, 3-31.X and 4.XII.1963.

Tropics and warmer temperate countries of the world; almost cosmopolitan, with strong migratory habits and probably also wind-carried.

N.B. — After the completion of this paper I received a letter from Mr. D. E. KIMMINS, of the British Museum (Nat. Hist.), in which he tells with regard to the Rapa Island Odonata, that the following species are represented in the collection: *Ischnura aurora*, *Diplacodes bipunctata* and *Pantala flavescens*. These were collected by Mr. COLLENETTE and Miss LONGFIELD during the "St. George" Expedition and labelled as collected by the former. Being obviously common species, presumably only a single pair of each of these was taken.

DESCRIPTIONS

Ischnura thelmae spec. nov. (Fig. 1)

Material. — 10 ♂, 2 ♀ (partly immature or discoloured), Rapa Island: Pt. Tepai Kutautau, 4.X.1963 (♂); Rapa Maii Bay, 23.X.1963 (2 ♂); Rapa Mau-gaoa, 1000 ft., 5 and 7.X.1963 (5 ♂) and 950 ft., 11.XII.1963 (2 ♂); Rapa Haurei, 18.IX and 3.XII.1963 (2 ♀, one with collector's note: "Coral red thorax"). All collected by Dr. J. F. GATES CLARKE and Mrs. THELMA M. CLARKE. Holotype ♂ and allotype ♀, Rapa Maii Bay, 23.X.1963 and Rapa Haurei, 3.XII.1963, respectively, in USNM (holotype ♂, reg. no. 68921). Paratypes of both sexes in USNM and the Leiden Museum.

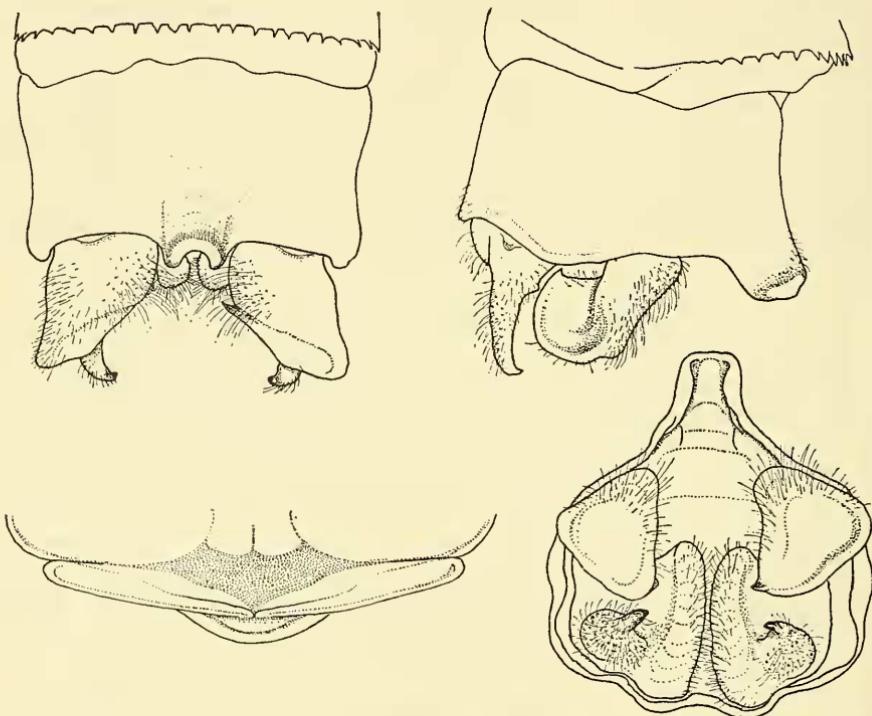


Fig. 1. *Ischnura thelmae* spec. nov., Rapa I. Terminal segments of abdomen and appendages of ♂ holotype, dorsal, left lateral and caudal view; posterior lobe of prothorax of ♀ allotype, dorsal view

Dr. GATES CLARKE informs me that the species was generally found at fairly high elevations and believes that the immature stages will be found in the axils of the leaves of *Freycinetia*. This plant is abundant on the steep hillsides and occasionally overlaps into the flat areas along the ridges of Rapa.

Male (adult). — Labium pale yellow. Labrum, mandible-bases, genal area, anteclypeus, and vertical surface of frons greenish yellow, this colour extending upward along margin of compound eye to a level about half-way the distance between fronto-clypeal suture and median ocellus; basal one-third of labrum shiny

bronze-black, forming a transverse mark slightly produced forward in the middle. Postclypeus black with brilliant bronze-green reflex, its surface finely transversely wrinkled and sparsely clothed with long yellow hair, especially so along front margin. Posterior limit of pale frontal stripe very irregular, the area surrounding the antennal sockets remaining black; there is an additional black spot, shaped like a broad triangle, placed in the middle of the frons at its base. Antennal sockets yellow green in front, the first antennal segment finely ringed with yellow apically; rest of antennae black. Dorsal surface of head, including occipital ridge, bronze-black with metallic green and coppery reflections; occipital lobes tumid, produced backwards as an obtuse-angulate swelling on either side, dorsally with a pair of moderately large, completely isolated, subcircular, blue postocular spots. Rear of the head mat black with a very large, oval, greenish yellow area adjoining the eyes on either side.

Prothorax shaped and coloured much as described for *I. taitensis*; anterior lobe, lower parts of pleurae, and a streak along lateral margin of posterior lobe, greenish yellow. Posterior lobe short and broad, the transverse ridge-like lateral divisions raised on either side of the middle, where they are lowest and gradually become obsolete; median division swollen, placed on a slightly lower level and produced backward as a short rounded lamella. Lamina mesostigmatis transverse, subtriangular in outline, strongly hollowed out dorsally; colour black, except the swollen hind margin, which is yellow, terminating on either side in a conspicuously raised and recurved bluntly triangular tubercle.

Synthorax, ground colour light yellowish- to bluish-green, the dorsum and part of the sides bronze-black with metallic green lustre; pattern very similar to that of *I. taitensis*, the antehumeral stripes a little narrower and straighter, widest and more or less club-shaped at extreme base, their upper extremities hardly noticeably expanded; outer border of dark humeral band lacking an angular extension at the shoulder-area, but recurved upper streak and marginal lines along dorsal crests present; black stripe at second lateral suture complete, slightly irregular and variable in width, widest dorsally and more or less forked at the metinfraepisternal suture. Remaining parts of thorax and striped pattern of legs exactly as described for *I. taitensis*.

Wings hyaline, neuration brown; 13—16 Px in fore wings, 11—13 in hind wings; 3 postquadrangular antenodal cells. There are two rows of cells between C and R_1 posterior to the pterostigma in one of the Rapa Maii Bay specimens, whereas in 5 others several cells are divided in one or more of the wings; lastly, in 4 males only a single cell-row is present. Arculus situated at Ax_2 , more rarely a trifle beyond that level in all wings. Course of Cu_2 in fore wing straight as far as the end of first to second cell beyond level of subnodus, thereafter strongly fractured and reaching the wing margin at about $Px_{6.7}$; in hind wing this vein ends its unbroken course at level of Px_2 , the fractured portion terminating at level of $Px_{7.8}$. Pterostigma not very different in shape and size in fore and hind wings, very oblique and distinctly higher than long in both pairs, this cell in fore wing differing from that of the hind wing only in that the outer distal angle is more drawn out, the anal side being, moreover, definitely outwardly convex. Colour of all pterostigmata dark brown surrounded by light chrome (possible bluish in life?).

heavily framed in dark brown; outer angle of fore wing *pt* including the inner margin of same more extensively pale-coloured than that of the hinder pair.

Abdomen shaped similarly to that of *I. taitensis*, the basal and terminal segments moderately expanded. Bronze-green markings of segm. 3—6 complete though less broad than those covering 1—2 and 7—10, widest basally and near apex of segments, where they are attached to complete, deep black apical rings; markings on the rest of the segments restricted to the dorsum, leaving not only narrow, transverse subinterrupted basal annules but also the whole of the sides chrome yellow. The complete dorsal marks of segm. 1—2 are shaped as in *I. taitensis*, the intersegmental annules being bright blue, as in that species. Terminal segments almost entirely black; latero-ventral border of tergites 8 and 9 narrowly striped with yellow, the intersegmental membranes of segm. 7—8, 8—9 and 9—10 likewise pale. Apical portion of segm. 10 strongly pinched and in the form of a prominent dorso-apical tubercle, the hind border of which is whitish apically, as shown in the figure. The penis has the shape and armature characteristic for the genus, i.e., the second segment carries a pair of robust divergent, almost straight, backwardly directed black spines, one on each side of a bluntly raised median tubercle, the slightly recurved tips of the spines reaching the dome of the third segment; this latter terminates in two ribbon-like recurved processes, much longer than the spines, shaped similarly to those figured by FRASER (1927) for the Samoan ischnurine *Amorphostigma auricolor* Fraser.

Anal appendages shaped as in fig. 1, similar to those of *I. taitensis* but differing in details of structure. Superior pair black, the lower part of the basal portion yellowish interiorly; surface shiny and clothed with the same longish hair as seen in *taitensis*. In some males the dorsal angulation of the superior appendage, just before the bend, is better pronounced than in others, forming a blunt, backwardly directed tooth-like projection, which is only poorly developed in the specimen figured.

Female (heterochromatic, orange colour form). — Labium pale yellow. Mouth-parts, face, and frons anteriorly, extensively orangish (between chamois and cinnamon, RIDGWAY). Black stripe at base of labrum ill-defined, acquiring soon a rusty brown tint and turning gradually to chrome beyond the median impression; postclypeus as in male, except that a transverse ferruginous spot is clearly discernible mid-basally. Dorsal surface of head orange with an irregularly shaped bronze-black band, widest in the middle, connecting the eyes across the vertex; the anterior border of this band is excavated on either side between median ocellus and antennal socket so as to save a prominent crown-shaped black dot placed immediately in front of the median ocellus. Antennal sockets orange, the segments themselves black. Epicranial lobes entirely orange, confluent with a transverse stripe at the occipital crest, this colour also occupying most of the occipital lobes ventrally, only the area surrounding the foramen remaining deep black.

Prothorax orange, save for a V-shaped black spot in the depression behind anterior lobe and a thick transverse bronze-black mark at the base of the posterior lobe, which itself is orange and shaped almost exactly as in the male (fig. 1). Lamina mesostigmalis less strongly concave dorsally than in male, the inner angle of its posterior rim not strongly protuberant but rounded and beset with a tuft of

long yellow bristles which are directed straight upward; colour orange with a black dot filling up the inner anterior angle of the lamina.

Synthorax throughout orange, marked with a sharply delimited, parallel-sided bronze-black mid-dorsal band leaving the outer one-half of the mesepisterna uncovered. Antealar triangles, axillaries and notal sclerites orange; thoracic sides and ventral surface orange, but the former with a continuous black line at the humeral suture and a tiny black streak at upper end of second suture.

Legs light orange, but all spines black; vestigial black spots are present at the junction of the trochanters and femora and also at the apices of the latter; outer faces of anterior and middle tibiae with an obliterated black stripe, the extremities of all tibiae and tarsal segments likewise black.

Wings clear, neuration brown, lighter towards the bases; 14 Px in fore wing, 12 in hind wing. Pterostigma lozenge-shaped, greyish yellow, smoky grey in the centre; slightly less oblique and a trifle more expanded (longer) than in the male, shaped similarly in fore and hind wings; 1—3 duplicated cells between C and R_1 only in the hind wings.

Abdomen, ground-colour orange; dorsum of all segments (save the basal ones) marked more broadly with metallic greenish black than in the male and differing as follows: segm. 1—2 throughout orange, the intersegmental annule of 2—3 brown; 3 with the dark band narrower than those on the succeeding segments, tapering forward and not quite reaching base of segment; orange rings at base of segm. 4—7 slightly wider than in the male and not interrupted by black in the median line; terminal segments unmarked save for diffuse light spots low down at the sides of 9 and 10. Apex of 8th sternite abruptly constricted so as to form a short, tooth-like, black vulvar spine. Valves and anal appendages obscured, outer gonapophyses with a yellow stripe; styli black.

The second female is an old adult specimen which differs from the previous one by having the body much darker generally. All orange tints are replaced by light brownish olive, the postocular spots also being much obscured. Markings dull bronze brown to black, the basal stripe of labrum and entire postclypeus very shiny. Black stripe at humeral and second lateral sutures of thorax slightly wider than in the other female, the last-mentioned stripe linear but complete, extending along full length. Wing membrane greyish yellow, venation almost black. There are 14 Px in the fore wings, 13 in the hinder pair. Abdomen with indication of a dark sub-apical transverse marking placed on mid-dorsum of segm. 2.

Measurements: ♂ abd. + app. 30.5—34.0 mm, hind wing 19.2—21.0 mm; ♀ 28.0—28.4 mm and 22.0 mm, respectively; most males measure 33 mm for the abdomen and 20 mm for the hind wing.

This interesting new species is chiefly remarkable for its large size, it being far superior in this respect to any other Old World member of the genus and even larger than the two described species of the allied *Amorphostigma* from Samoa. The male has the facies of a compactly built *Teinobasis* or *Nesobasis*, but the head is larger and all characters are decidedly those of a typical *Ischnura*. Apart from its dimensions, the male of *I. thelmae* is easily distinguished from its congeners by the bulging epicranial lobes, unmarked terminal segments of abdomen, as well

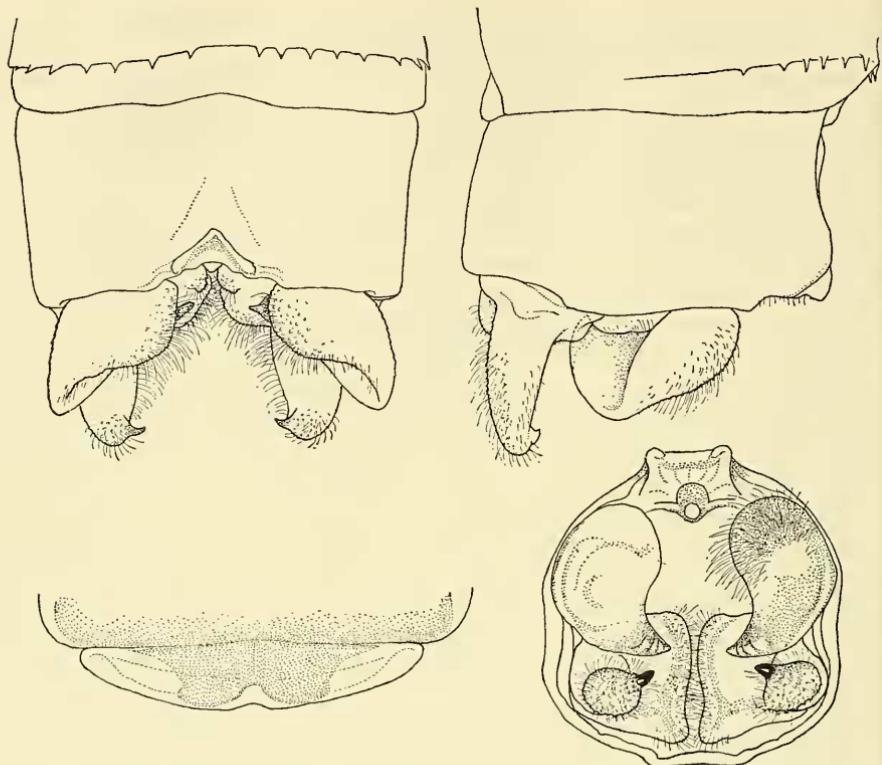


Fig. 2. *Ischnura taitensis* Selys, Tahiti (Fautaua). Terminal segments of abdomen and appendages of ♂, dorsal, left lateral and caudal view; posterior lobe of prothorax, dorsal view, of ♀ from Ape-Aotai trail

as by the shape of its anal appendages. In the last two characters it approaches *I. taitensis* Selys fairly closely, these two species being undoubtedly nearly related, taking an isolated position within the genus.

I have much pleasure in dedicating this dragonfly to its discoverer, Mrs. THELMA M. CLARKE.

Ischnura taitensis Selys, 1876 (fig. 2)

1876. SELYS, Bull. Acad. Belg. [2] 41: 279—280 (35—36 sep.). — ♂ ♀ Ile de Tahiti (*I. taitensis* sp.n.)
 1942. FRASER in MUMFORD, Ann. Mag. Nat. Hist. [11] 9: 646—647, fig. 1—2 (♂ app.), 3 (pterost. of fore wing). — ♂ Tahiti (*I. cheesmani* sp.n., syn. nov.)

Material. — ♂ (juv., holotype), ♀ (semiad., allotype), both labelled by DE SELYS "Tahiti" and "taitense Selys" (♂) or "taitense" (♀) on pinkish labels (IRSN); ♂ (ad.), Tahiti, Mt. Aorai, NW Ridge, 1400 m, 11.VII.1961, native collector (BISH); ♂ (ad.), Tahiti, Fautaua near Papeete, 25 m, 5-11.VII.1961, Malaise trap, J. L. GRESSITT (ex BISH, ML); 2 ♀ (ad., isochromatic), Tahiti, Faie Rau Ape-Aotai trail, 15.II.1962, N. L. H. KRAUSS (BISH & ML).

Male (ad., Fautaua). — Labium pale ochreous, its median area glaucous. Labrum green with the basal one-third in the form of a sharply defined glossy black band which is slightly produced forward and obtuse-angulate medially. Mandible-bases, genae and anteclypeus bright green, the light area on the genae extending upwards along the eye-margin to a level almost as far as the median ocellus. Postclypeus shiny metallic greenish black, its surface rather convex, finely transversely wrinkled. Anterior surface of frons on each side of the middle with a two-pronged green mark directed obliquely inward, the branches of this spot divergent, narrow and tapered, the anterior branch a little longer than the posterior one and separated by black in the median line. Head otherwise deep bronze-black above with slight metallic green lustre; a tiny yellow dot in front of the median ocellus, and epicranium with a pair of large and conspicuous, bright blue, subtriangular postocular spots, which are on all sides surrounded by black. Occipital crest unmarked. Rear of the head bicoloured: outer half of the surface bright blue, the inner half black with a comma-shaped dark off-shoot invading the blue colour towards the eye-margin. Antennae black, apex of first segment narrowly ringed with blue.

Prothorax predominantly bronze-black, anterior lobe bright blue finely bordered with black anteriorly; pronotal tubercles and most of the sides black, the former evenly convex; posterolateral portion of proepimerum including the lower processes, green. Posterior lobe short, consisting of three portions: lateral divisions directed almost straight upward and separated from one another by a shallow emargination, the midlobe a little more swollen, placed on a slightly lower level and directed caudad; whole structure black, except the lateral divisions whose outer rims are bordered with green. Lamina mesostigmalis subtriangular in outline, dorsal surface of each strongly hollowed out with raised swollen margins which themselves bear a bright green halter-shaped mark posteriorly.

Dorsum of synthorax, to a level about half-way between humeral and first lateral suture, deep black with slight metallic blue lustre; with a pair of complete, parallel, bright green antehumeral bands, which are distinctly widened, more or less club-shaped, on either end, extending almost as far as the ante-alar triangles at their upper extremities; mesepisternal dark colour irregularly bordered externally, encroaching on the blue of the thoracic sides to form a squarish extension upon the shoulder area and a short recurved streak invading the blue near the dorsal crest of the mesepisternum; mesinfraepisternum black with a triangular mark of blue-green adjoining the mesocoxa. Sides otherwise bright blue with a complete irregular black stripe on the second suture; this stripe widened (though also constricted) towards the dorsal crest; metinfraepisternum yellow-green outlined with black at the upper suture; ventral surface lemon yellow. All scutellar areas, wing processes and axillaries spotted with blue.

Legs bright ochreous green, the coxae each with a tiny dark basal spot and all femora heavily striped with black exteriorly; tibiae and tarsi dark ochreous, outer faces of anterior tibiae also with a continuous black stripe, but stripes along posterior two pairs of tibiae obliterated; the basal one-third of inner faces of tibiae likewise black; tarsal segments black-tipped.

Wings hyaline, neuration brown; 10 Px of first series in fore wing, 9 in hind

wing; 3 postquadrangular antenodal cells; arculus at or a little distal to Ax_2 in both pairs of wings; course of Cu_2 straight as far as the end of the third or fourth cell following the quadrilateral in fore wings, of the fourth or fifth in the hind wings. Pterostigma dissimilar in shape and size in fore and hind wings, all very oblique; pt of fore wing about one-fourth longer than that of hind wing, sides strengthened and a little outbent in all wings. Fore wing pt two times longer than high, the proximal side only half the length of costal side and a little shorter than the distal one, which is more oblique; distal and anal sides forming a single convexity; costal side black but inner margin of distal side blue on upper surface; colour of cell jet-black dorsally for its proximal three-fifths, bright blue for the rest, with a yellow streak along costal margin; ventrally the cell is black save for a similar streak along costa. Hind wing pt only little longer than high, lozenge-shaped, almost parallel-sided; colour grey-brown on either surface and surrounded by a yellow line.

Abdomen of the usual shape and colour, marked broadly with bronze-black on the dorsum of all segments, the two basal ones rather more brilliant and more greenish black than the next; all markings a little expanded subapically and broadly attached to narrow black apical rings. Intersegmental membrane of segm. 1—2 bright blue, those of the intermediate segments obscured, and of 8—9 and 9—10 yellowish (possibly blue in life?). Segm. 3—7 have narrow clear yellow basal annules finely interrupted by black on mid-dorsum. Sides of segm. 1—2 blue, base of 3 blue-green, and of the remainder clear ochreous. Terminal segments unmarked, except laterally, the raised and excavated posterior border of segm. 10 yellow, as shown in the figure. Anal appendages shaped as in fig. 2; superior pair black, smooth and shiny interiorly, clothed with long pale pubescence above and within; inferior appendages a little longer and much more slender, their colour ochreous, save the outer border and apices, which are black.

Penis shaped similarly to that of *I. thelmae* (antea: 94), the backwardly directed black spines of the second segment are longer, the apices acute and rather abruptly downcurved; terminal processes of third segment shorter and narrower than in *thelmae*, evenly curved, about equal in length to the spines of second segment.

The above male corresponds in every respect with what has remained of the holotype, which is an incomplete specimen, quite immature, and lacking most of its abdominal segments. The 10th segment and left pair of anal appendages are, however, still intact in the type, whose characteristic face marks and enlarged post-ocular spots are still clearly shown.

The third male now before me, from Mt. Aorai, is far superior in size. It is a discoloured specimen, but as far as can be seen its markings are similar, except that the black lateral thoracic stripe is slightly wider; the blue antehumeral bands are, on the contrary, somewhat narrower than in the example described. The 10th segment and anal appendages are identical in shape, but the form of the pterostigmata in the Mt. Aorai male is rather different: in both pairs of wings it is shorter, only little longer than high in the fore wing and even slightly higher than long in the hind wing. It has also 11 instead of only 10 Px in fore wings, 9 in the hinder pair.

Female (isochromatic). — Labrum blue-green, the black basal stripe narrower

than in the male, occupying about one-fourth of whole depth of labrum. Mandible-bases and anteclypeus chrome yellow; genae light green, this colour extending upwards along the eye margin as far as the antennal sockets, which themselves are likewise green; postclypeus and a transverse crescent at the frontoclypeal suture, bronze-black; horizontal part of frons in the middle, as well as the rest of the dorsal surface posterior to it, bronze-black, with the exception of a light triangle in front of the median ocellus, a pair of very large subcircular postocular spots, and a greenish transverse stripe at the occipital crest.

Prothorax as in the male, except that each of the pronotal tubercles bears a green lateral spot, varying in size and shape. Posterior lobe shaped much as in the male, but lateral lobes less strongly upcurved, directed obliquely backwards and separated from one another only by a shallow emargination on a slightly lower level than the margins on either side of it; median division vestigial, not projecting caudad and visible only when viewed from behind (fig. 2). Light-coloured areas of thoracic segments bright blue-green, turning to green laterally and chrome yellow underneath. Antehumeral stripes a little longer and wider than in the male, especially at either end, completely filling up the lower edges of the mesepisterna outwardly; bronze-black bands at the humeral and second lateral sutures narrower, the former with a linear extension along the dorsal crest.

Wings with 11 Px in fore wing, 9 in hinder pair; pterostigma of fore wing only about one and one-third larger than that of the hind wing, proximal and costal sides of equal length in both, but costal side in fore wing shorter than the anal and distal side more strongly convex than that of the hind wing; colour grey-brown surrounded by yellow.

Abdomen coloured and marked similarly to the male, the intersegmental membrane of segm. 1—2 blue, those of 7—8 and 8—9 yellow; vulvar spine short; appendages conical, obscured; valves light chrome, not surpassing apex of anal tubercles.

Measurements: ♂ abd. + app. 21.0 mm, hind wing 13.2 mm (Fautaua), 26.7 and 16.0 mm (Mt. Aorai), respectively; ♀ 25.8—26.5, 17.7—19.0 mm.

Both male and female types are at present in a very dilapidated condition, various body parts having been repeatedly mended since the time of description. Owing to the juvenile state of the male and the loss of colour in either sex, these insects could have been defined hardly better; all the same, SELYS's original description is inevitably quite misleading. *I. taitensis* is, in fact, a brightly coloured insect, chiefly distinguished from other species by the following combination of characters: (1) exceptionally large size of blue postocular spots; (2) conspicuous blue-and-black pterostigma of male fore wing; (3) absence of colour marks on terminal segments of abdomen, and (4) shape of 10th abdominal segment and anal appendages of the male.

The discrepancies in size and details of the venation between the Mt. Aorai and Ape-Aotai specimens on the one hand, and the types (along with the male from Papeete) on the other, are worthy of note. These can probably be explained by the former having been taken at a much higher level than the latter. Ecotypic differentiation of forms with an extensive and fairly continuous vertical distribution is a common phenomenon also among dragonflies. Several examples are now

known of species in Java, Celebes and New Guinea ranging from the coastal forests into the lower mountain zone, or even much higher, whose representative populations remain unchanged structurally but at higher elevations show a marked increase in size combined with an obscured colour design and various deviations of the more 'normal' wing venation.

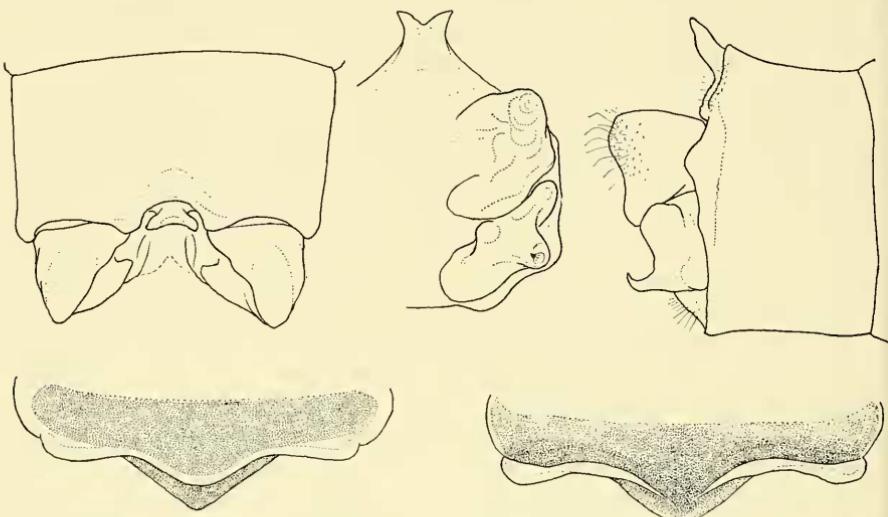


Fig. 3. *Ischnura spinicauda* Brauer, holotype from "Polynesien". Terminal segment of abdomen and appendages, dorsal, caudal and right lateral view (upper row). Posterior portion of prothorax, dorsal view of ♂ holotype of *I. spinicauda* Brauer (left) and *I. a. aurora* Brauer, ♂ from Tahiti (right) (lower row)

I. taitensis is obviously the same species as *I. cheesmani* Fraser in MUMFORD (1942: 646—647), described from a single male in the Royal Scottish Museum, Edinburgh. This came from Hitiaa, Tahiti, 10 July, 1925, L. E. CHEESMAN coll., and is stated by its describer to be "easily distinguished from *I. taitensis* Selys, by the presence of a lateral black stripe on thorax"; which is, in fact, exactly one of the characters of *I. taitensis*. For the rest, FRASER's description is grossly superficial and his figures are worthless. All characters given for *cheesmani* in the description also apply to *I. taitensis* and hence there can be no doubt that the two are conspecific.

Still another endemic *Ischnura* from the Society Islands (Raiatea and Bora), apparently known only from two males in the British Museum, is *I. cardinalis* Kimmings (1929). Like *I. aurora*, the male is characterized by a variegated body pattern consisting of orange, blue and bronze-black; but *I. cardinalis* is superior in size and easily distinguished from other species by the blood red fore wing pterostigma and the great length of the inferior appendages of the male, the latter being over two times longer than the superior pair.

Ischnura spinicauda Brauer, 1865 (Fig. 3)

1865. BRAUER, Verh. zool.-bot. Ges. Wien 15: 511 (latin diagnosis). — ♂ Polynesien (*Agrion [Ischnura] spinicauda* n.sp.)

1866. BRAUER, Neuropteren, in Novara Expedition, Zool. 1 : 57—58, tab. I fig. 13 (♂ app.). — ♂ "Polynesien (ohne nähere Angabe)" (*Agrion [Ischnura] spinicauda*).
 1876. SELYS, Bull. Acad. Belg. [2] 42 : 990—991 (additional note).

Material. — ♂ (holotype), labelled "Ischnura spinicauda Br. Polynä." (BRAUER's writing), "Ischnura spinicauda Br. ♂ Type, Novara Reise 1857—59"; in the Naturhistorisches Museum, Wien.

For many years I, and possibly other students with me, have been looking about for this remarkable species. If in the last decades it had been at all represented in the many collections brought home from the various island groups in the Pacific, it would surely have been recognized. Up to this time it has, however, never been found again. With its nearest ally, the widely distributed *I. aurora* Brauer, the unique type of *I. spinicauda* is probably the fullest and best described member of the genus; for a general characterization the reader is, therefore, referred to the original description. A re-examination of the type reveals the following differences as compared with topotypical examples of *I. aurora* in our collection:

spinicanda

Posterior lobe of prothorax trilobate, the edges of the lateral divisions evenly rounded and only slightly raised and thickened; upper portion of median division on level with the lateral ones and with a continuous pale border; triangular lower portion of median division (midlobe) projecting caudad on a slightly lower level (fig. 3, left).

Abdomen, segm. 3—7 orange-red, scarcely and indistinctly obscured apically, 7 with bronze-black apical mark tapered to a point toward base and occupying terminal one-third or a little less of segment.

Bifid dorso-apical tubercle of segm. 10 more strongly raised, the tubercles closely approximated, arising from a narrow, rather pinched basal cone (fig. 3).

Sup. anal app. in lateral view with its apex above more broadly rounded; outer branch of inf. app. longer, ending in a strongly upcurved finely pointed hook (fig. 3).

aurora (Tahiti)

Posterior lobe of prothorax trilobate, the edges of the lateral divisions more swollen and prominent but ridges gradually declining towards the middle and interrupted medially at a point where the surface is sunk; lower portion of median division similar to *spinicanda* (fig. 3, right).

Abdomen, segm. 3—6 orange-red with finely black terminal rings, 6 with subapical bronze-black mark, variable in shape and size, usually attached to a black ring at apex of segment; segm. 7 wholly black.

Bifid dorso-apical tubercle of segm. 10 lower, the tubercles well separated from each other by a shallow emargination.

Sup. anal app. in lateral view more elongate and narrowly rounded at apex above; outer branch of inf. app. thicker and more evenly upcurved.

As pointed out in BRAUER's more elaborate description contained in the "Novara Expedition", *I. spinicauda* can be distinguished from *aurora*, apart from the colour differences, by the more prominent process at the apex of the 10th segment and also by the shape of the appendages. BRAUER's figures of the former are, however, not quite correct and rather exaggerated. I am, therefore, giving camera lucida drawings of these terminal structures taken from the type specimen, the origin and proper habitation of which still remain unknown.

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